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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/576,385

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Steven S. C. Chuang

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EXAMINER

ESSEX, STEPHAN J

ART UNIT

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/576,385	Applicant(s) CHUANG, STEVEN S. C.	
	Examiner STEPHAN ESSEX	Art Unit 1727	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 June 2011.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on ____; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 5) ☒ Claim(s) 1-36,41 and 42 is/are pending in the application.
- 5a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 6) ☐ Claim(s) ____ is/are allowed.
- 7) ☒ Claim(s) 1-36,41 and 42 is/are rejected.
- 8) ☐ Claim(s) ____ is/are objected to.
- 9) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☒ The drawing(s) filed on 19 April 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 12) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____. |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date ____. | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

1. The applicant's arguments filed on June 22, 2011 were received.
2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 103

3. Claims 1-3, 5-7, 9-11, 13-26, 28, 29, 31-35, 41 and 42 remain rejected under 35 U.S.C. 103(a) as being unpatentable over Gur et al. (hereinafter "Gur") (U.S. Pat. No. 5,376,469) in view of Barnett (U.S. Pub. No. 2002/0098401A1) and Stark et al. (hereinafter "Stark") (U.S. Pub. No. 2004/0126298).

Regarding claims 1, 2, 6, 7, 9-11, 23-26 and 28, Gur teaches a high temperature fuel cell **10** that uses an oxygen ion conducting solid electrolyte **30** (solid-oxide electrolyte) in conjunction with separate temperature zones **14**, **16** to optimize the direct electrochemical conversion of carbon fuels **12** (solid-state organic fuel) to electrical energy (direct-electrochemical-oxidation fuel cell) (see col. 2, lines 18-22). The solid electrolyte **30** has first and second electrolyte surfaces **32**, **34** on which are deposited first (anode) and second (cathode) electrodes **36**, **38**, respectively (see col. 2, lines 37-41). Oxygen is provided to the carbon fuel **12** (direct electrochemical oxidation) by supplying an oxygen containing gas to the second electrode **38**, the driving force for conduction of the oxygen ions through the solid electrolyte **30** being provided by the difference between the activities of oxygen in the fuel compartment (anode) and in the

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oxygen containing gas supplied to the second electrode **38** (formation of oxygen ions) (see col. 2, lines 64-68; col. 3, lines 1-3).

Gur is silent to an electrochemical-reduction catalyst and an electrochemical-oxidation catalyst.

Barnett teaches a solid oxide fuel cell for the direct electrochemical oxidation of hydrocarbons in solid oxide fuel cells wherein the anode may comprise NiO-YSZ (see paragraph 62). The cathode may comprise $\text{La}_{0.8}\text{Sr}_{0.2}\text{MnO}_3$ (lanthanum strontium manganese oxide) or LSCF (see paragraphs 83 and 107). It would have been obvious to one of ordinary skill in the art to have utilized the anode and cathode materials of Barnett in the fuel cell of Gur because the selection of a known material, which is based upon its suitability for the intended use, is within the ambit of one of ordinary skill in the art. See *In re Leshin*, 125 USPQ 416 (CCPA 1960) (see MPEP § 2144.07).

Stark teaches that the yttria stabilized zirconia catalysts used in fuel cells may comprising additional catalytically active components such as nickel oxides, may further comprise rhenium or platinum (Re-NiO/YSZ) (see paragraphs 50 and 68). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided the catalyst of Stark in the fuel cell of modified Gur because the selection of a known material, which is based upon its suitability for the intended use, is within the ambit of one of ordinary skill in the art. See *In re Leshin*, 125 USPQ 416 (CCPA 1960) (see MPEP § 2144.07).

Regarding claims 3 and 29, Gur teaches that the carbon fuel **12** (solid-state organic fuel) may be coal (see col. 6, lines 27-32).

Regarding claims 5 and 33, Gur teaches that the carbon fuel **12** is heated to a temperature that favors complete oxidation of the carbon fuel **12** to CO₂ (at least 50 mol % CO₂) (see col. 2, lines 56-61).

Regarding claims 13, 14, 31, 32, 41 and 42, Gur teaches that suitable solid electrolytes **30** may be generated by doping oxides of Bi or Zr with rare earth oxides such as Y₂O₃ (see col. 5, lines 7-11).

Regarding claims 15 and 16, Gur teaches that the fuel cell **10** comprises fluidized bed reactor **50** (housing) including a bottom surface **52** having gas inlets **25**. In operation, fine particles of carbon fuel **12** are introduced (feed passage) into fuel compartment **20** of fluidized bed reactor **50**. A stream of non-reactive gas is blown through gas inlets **25** to distribute the fine particles of carbon fuel **12** throughout the fuel compartment **20** (see col. 7, lines 61-66).

Regarding claims 17, 19, 21, 22 and 35, Gur, Barnett and Stark do not explicitly teach the NO_x concentration of the anode product, the CO concentration in the cathode product, the electrical current density, or the fuel-conversion efficiency. However, it is the position of the examiner that these concentrations are inherent, given that the fuel cell of modified Gur is structurally and chemically identical to that of the claimed invention. A reference which is silent about a claimed invention's features is inherently anticipatory if the missing feature is necessarily present in that which is described in the reference. Inherency is not established by probabilities or possibilities. See *In re Robertson*, 49 USPQ2d 1949 (1999).

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Regarding claims 18 and 20, Gur teaches that the fuel cell **10** is typically operated at temperatures no greater than 1100° C (maximum operating temperature of about 1200° C (see claims 11-13).

4. Claims 4 and 30 remain rejected under 35 U.S.C. 103(a) as being unpatentable over Gur, Barnett and Stark as applied to claims 1-3, 5-7, 9-11, 13-26, 28, 29, 31-35, 41 and 42 above, and further in view of Coors (U.S. Pat. No. 7,332,237) and Paisley (U.S. Pat. No. 6,680,137).

Regarding claims 4 and 30, Gur, Barnett and Stark are silent to peat, rice hulls and corn husks.

Coors teaches that fuel cells operating on solid carbon fuels may be pyrolyzed biomass. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized biomass fuel in the fuel cell of modified Gur because Coors teaches biomass as a functional equivalent of coal (see col. 13, lines 39-59).

Paisley teaches that biomass fuels include peat and agricultural waste (see col. 6, lines 29-32). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized peat or agricultural waste as the biomass fuel in the fuel cell of modified Gur because the selection of a known material, which is based upon its suitability for the intended use, is within the ambit of one of ordinary skill in the art. See *In re Leshin*, 125 USPQ 416 (CCPA 1960) (see MPEP § 2144.07).

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5. Claims 8 and 27 remain rejected under 35 U.S.C. 103(a) as being unpatentable over Gur, Barnett and Stark as applied to claims 1-3, 5-7, 9-11, 13-26, 28, 29, 31-35, 41 and 42 above, and further in view of Visco et al. (hereinafter "Visco") (U.S. Pub. No. 2006/0057295A1).

Regarding claim 8, Gur, Barnett and Stark are silent to a material having the formula $A_xB_yCO_3$.

Visco teaches $Sm_{0.5}Sr_{0.5}CO_3$ as a functional equivalent of lanthanum strontium manganese oxide (see paragraph 54). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have substituted $Sm_{0.5}Sr_{0.5}CO_3$ for the lanthanum strontium manganese oxide in the cathode of modified Gur because the selection of a known material, which is based upon its suitability for the intended use, is within the ambit of one of ordinary skill in the art. See *In re Leshin*, 125 USPQ 416 (CCPA 1960) (see MPEP § 2144.07).

6. Claims 12 and 36 remain rejected under 35 U.S.C. 103(a) as being unpatentable over Gur, Barnett and Stark as applied to claims 1-3, 5-7, 9-11, 13-26, 28, 29, 31-35, 41 and 42 above, and further in view of Giaquinta et al. (hereinafter "Giaquinta") (U.S. Pub. No. 2007/0010396A1).

Regarding claim 12, Gur, Barnett and Stark are silent to Cu oxide-Pt.

Giaquinta teaches an oxidation catalyst for fuel cells consisting essentially of platinum and copper oxides (see paragraphs 37 and 41). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided the

oxidation catalyst of Giaquinta in the fuel cell of modified Gur because the selection of a known material, which is based upon its suitability for the intended use, is within the ambit of one of ordinary skill in the art. See *In re Leshin*, 125 USPQ 416 (CCPA 1960) (see MPEP § 2144.07).

Response to Arguments

7. Applicant's arguments filed June 22, 2011 have been fully considered but they are not persuasive.

Applicant's principle arguments are as follows:

A) *Applicant submits that Gur et al. does not disclose or teach a direct-electrochemical-oxidation for generating electricity from a solid-state organic fuel because Gur teaches that coal is converted to gaseous fuel prior to combustion.*

B) *Gur teaches that pure carbon fuels undergo combustion by two different reactions, as depicted by equations III and IV. Therefore, the fuel cell of Gur does not use solid-state fuel because the fuel is in a gaseous state.*

8. In response to Applicant's arguments, please consider the following comments:

A) In support of their position, Applicant cites col. 1, lines 39-46 of Gur. This citation, however, corresponds to the background section of Gur and is in the context of a discussion of the prior art. Gur explicitly teaches that it is desirable to develop methods for the direct conversion of solid fuels such as coal into electrical energy to

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eliminate the energy and efficiency costs of intermediate gasification steps (see col. 2, lines 7-10).

B) Equation IV corresponds to the direct electrochemical oxidation reaction recited in claim 1 and Gur teaches that equation IV is preferred since it consumes more oxygen and makes available more chemical energy for conversion to electrical current (see col. 6, lines 38-40).

Conclusion

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to STEPHAN ESSEX whose telephone number is

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(571)270-7866. The examiner can normally be reached on Monday - Friday, 7:30-5:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Barbara Gilliam can be reached on (571) 272-1330. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/SJE/

/Barbara L. Gilliam/

Supervisory Patent Examiner, Art Unit 1727